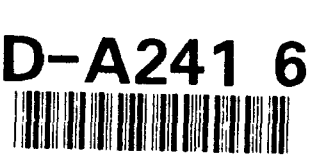

NAVAL POSTGRADUATE SCHOOL
Monterey, California

THESIS

OPERATION AND FUNDING OF THE
REGIONAL WARTIME CONSTRUCTION MANAGER

by

Paul Stephen Cook

December, 1990

Thesis Advisor: James M. Fremgen

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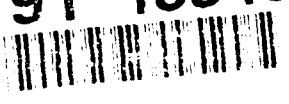

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19 ABSTRACT (Continue on reverse if necessary and identify by block number)

THIS THESIS PREPARES A TRAINING EXERCISE SCENARIO FOR THE NAVY'S REGIONAL WARTIME CONSTRUCTION MANAGER - MEDITERRANEAN (RWCM). THE RWCM IS A RESERVE ORGANIZATION WHICH HAS THE RESPONSIBILITY FOR WARTIME OR CONTINGENCY CONSTRUCTION MANAGEMENT. TO AID IN THE TRAINING EXERCISE OF THE MANAGEMENT OF RESOURCES, A RESOURCE COST MODEL IS DEVELOPED. FIRST, A CONTEXT FOR THE USE OF THE MODEL IS PROVIDED BY EXAMINING THE TWO FUNDS USED IN CONTINGENCY CONSTRUCTION; OPERATIONS AND MAINTENANCE (O & M) AND MILITARY CONSTRUCTION (MILCON). NEXT, THE POLICIES OF TITLES 10 AND 41 OF THE U.S. CODE, WHICH PERMIT THE USE OF UNOBLIGATED MILCON FUNDS AND DEFICIENCY SPENDING, ARE DISCUSSED. FINALLY, THE DIRECT LABOR AND OVERHEAD COSTS OF THE RWCM STAFF, THE DEPUTY, AND THE AREA MANAGERS ARE ESTIMATED. THE TOTAL COST IS ESTIMATED TO RANGE FROM $12.5 TO $15.2 MILLION PER YEAR.

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OPERATION AND FUNDING OF THE REGIONAL WARTIME CONSTRUCTION MANAGER

by

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Lieutenant Commander, United States Navy,
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B. ARCH, University of Houston, 1980

Submitted in partial fulfillment
of the requirements for the degree of

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ABSTRACT

This thesis prepares a training exercise scenario for the Navy's Regional Wartime Construction Manager - Mediterranean (RWCM). The RWCM is a reserve organization which has the responsibility for wartime or contingency construction management. To aid in the training exercise of the management of resources, a Resource Cost Model is developed. First, a context for the use of the model is provided by examining the two funds used in contingency construction; Operations and Maintenance (O & M) and Military Construction (MILCON). Next, the policies of Titles 10 and 41 of the U.S. Code, which permit the use of unobligated MILCON funds and deficiency spending, are discussed. Finally, the direct labor and overhead costs of the RWCM staff, the deputy, and the area managers are estimated. The total cost is estimated to range from $12.5 to $15.2 million per year.

TABLE OF CONTENTS

I. INTRODUCTION

A. GENERAL

This thesis examines some fundamental fiscal questions about the Navy's Regional Wartime Construction Manager - Mediterranean (RWCM-MED). The RWCM-MED, also referred to here as the RWCM, is a Naval Reserve unit and, when mobilized, is responsible for the management of construction projects and resources in its region. The RWCM organization initially requested that an exercise scenario be prepared for reserve training purposes. However, in order for a management exercise of construction resources to be effective, a cost model was necessary. Consequently, both a cost model and an exercise scenario are developed. Before these developments, however, the thesis answers the following questions about construction funds and funding procedures:

1. What kinds of construction funds are used in the execution of the RWCM's duties?

2. If Military Construction funds are required, what are the current procedures in place for contingency situations? Will this current process be effective in a short duration contingency (180 days or less)?

3. How is the RWCM responsible for administering these funds?

4. What costs are required to operate this organization upon mobilization?

B. BACKGROUND

The Regional Wartime Construction Manager is part of the U.S. European Command (USEURCOM). Upon mobilization for a European conflict, the Army, Air Force and Navy are the construction managers for specific areas in Europe. The Air Force has responsibility for Northern Europe; the Army, Central Europe; and the Navy, the Mediterranean area. Each manager is responsible for the area management and construction resource use.

Since there has not been a war or other contingency in the recent past which has caused this organization to be activated, many of the policies and procedures have never been thoroughly examined or executed. Specifically, those questions regarding funding laws and procedures, as well as resource management and costs, all need to be analyzed.

C. METHODOLOGY

This thesis examined existing laws, directives, operations plans, and manning documents. Interviews were conducted with the RWCM organization; the Planning and Construction Divisions of the Naval Facilities Engineering Command, Atlantic Division; and the Army Corps of Engineers, Engineering Studies Center. The primary focus was on examining and answering those questions previously listed.

D. SCOPE AND LIMITATIONS

As stated earlier, there are three Regional Wartime Construction Managers who perform the same duties over three

separate regions in Europe. The scope of this thesis is limited to the cost and funding assessment of the Navy and does not address either of the other services.

Since this organization has never been activated, there can be no analysis of actual cost and management data. Only existing policies, directives, instructions, and personal judgments can be used for this study.

E. ORGANIZATION OF THESIS

Following this chapter, in Chapter II, describes the Regional Wartime Construction Manager, his organization and its mission.

Chapters III and IV, provide answers to the thesis questions. Chapter III shows that there are two kinds of construction funds used in the RWCM - Operations and Maintenance (O & M) and Military Construction (MILCON) funds. Military Construction funds are not normally required in a 180 day contingency. However, what is discussed are the policies of U.S. Code Titles 10 and 41 regarding the use of appropriated funds or spending on a deficient basis in the case of a war or contingency. It is also shown that the RWCM is not responsible for the administration of construction funds.

Chapter IV attempts to estimate the cost of operating the RWCM organization. The direct labor and overhead costs of this organization might range from $12.5 to $15.2 million per year.

The Resource Cost Model is developed and demonstrated in Chapter V. The exercise scenario is described and all pertinent administrative information is included in this chapter. The actual exercise involves a series of 150 messages, which are not included in this thesis, but, can be obtained from the Commander in Chief, U.S. Naval Forces, Assistant Chief of Staff - Engineering, 200 Stoval Street, Alexandria, Virginia, 22331-2301.

II. REGIONAL WARTIME CONSTRUCTION MANAGER

A. INTRODUCTION

1. General

The Regional Wartime Construction Manager (RWCM) is part of the U. S. European Command (USEURCOM). The RWCM's main responsibility is to manage the military construction program for U.S. forces during a war or other contingency. This chapter defines his areas of responsibility and describes the organization. The primary source of this information is the CINCUSNAVEUR, RWCM-MED Operations Plan [Ref. 1].

2. Regions of Responsibility

To meet its requirements, USEURCOM is divided into three geographical regions: Northern Europe, Central/Southern Europe and the Mediterranean. The Commander-in-Chief, U.S. Naval Forces Europe (CINCUSNAVEUR) has been designated the RWCM for the Mediterranean region (RWCM-MED). The actual regions assigned to CINCUSNAVEUR (RWCM-MED) are:

1. Algeria
2. Greece
3. Italy
4. Israel
5. Lebanon
6. Libya
7. Mediterranean islands

8. Morocco

9. Portugal

10. Spain

11. Syria

12. Tunisia

13. Turkey

B. ORGANIZATION

1. Regional Wartime Construction Manager

During peacetime and the transition phase to war, the CINCUSNAVEUR Fleet Civil Engineer (FCE) and his active duty staff perform the RWCM-MED duties and responsibilities on a collateral duty basis. However, during a war or other contingency, the RWCM-MED function is activated and the duties pass to mobilized reserve personnel. Once the selected reserve RWCM-MED staff are in place and ready, execution of these responsibilities comes under the Assistant Chief of Staff for Engineering (CINCUSNAVEUR 07-ACOS/ENGR). This position is a mobilization billet and will be filled by a Rear Admiral, Civil Engineer Corps. Figure 1 shows the mobilized organization of the CINCUSNAVEUR 07-ACOS/ENGR (RWCM-MED).

2. Deputy Regional Wartime Construction Manager

Currently, the position of Deputy Regional Wartime Construction Manager is not included in the current RWCM Operations Plan or in any formal document. However, there has been a proposal to incorporate two deputies [Ref. 2]. A Navy deputy, probably the Reserve Naval Construction Brigade,

CINCUSNAVEUR FLEET CIVIL ENGINEER/

RWCM (MED) MOBILIZATION ORGANIZATION

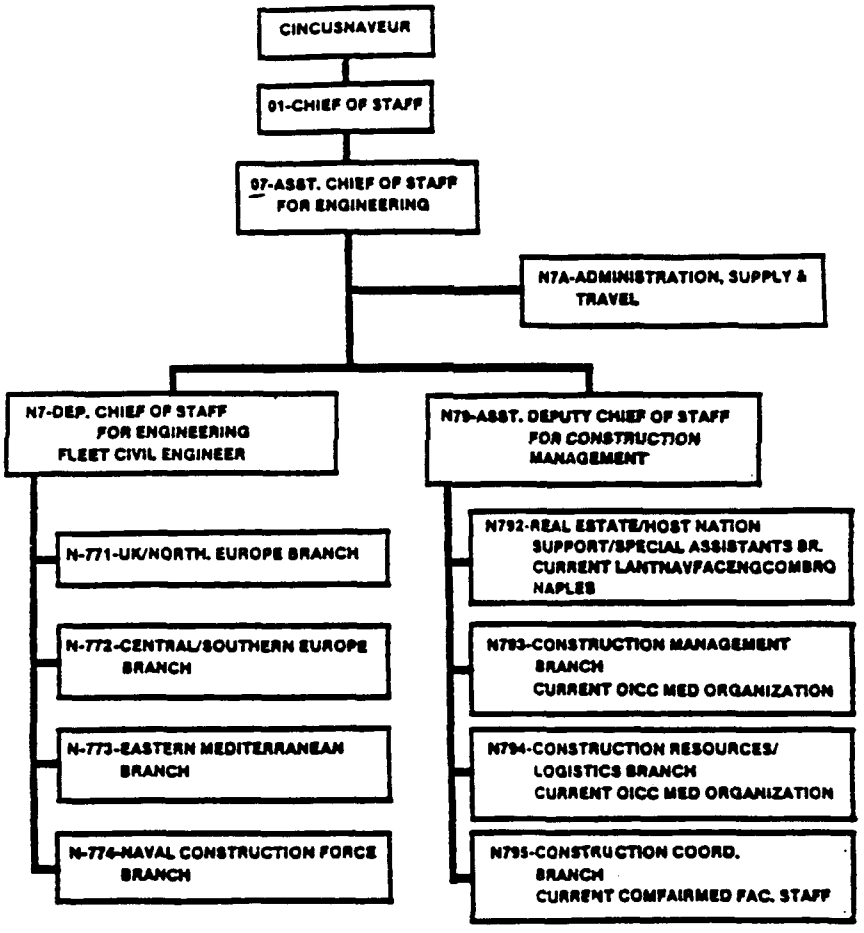


FIGURE 1

would be responsible for the Navy Area Wartime Construction Managers (AWCMs) and an Army deputy, for the Army AWCMs. This thesis assumes the incorporation of the two deputies.

3. Area Wartime Construction Manager

To properly conduct the military construction program over his 13 areas of responsibility, the RWCM-MED is divided among six area managers, otherwise known as Area Wartime Construction Managers (AWCM). These AWCMs will be Navy and Army construction organizations (Navy Construction Regiments or Army Corps of Engineers units) and report directly to a deputy. Each AWCM will accomplish the necessary construction by either of two methods, construction by military forces (troop construction assets) or by contract construction.

4. Troop Construction Assets

The troop construction assets available to the AWCM in any particular region will vary in size and type. The local component commander in the regions will provide these troop construction assets. The Navy will have Naval Construction Battalions (SEABEES), the Army similar engineer units.

Each construction unit possesses approximately 700 to 1400 personnel plus tools, equipment, and other necessary resources. One SEABEE battalion is able to provide approximately 3,060 manhours of construction labor per day. Depending on the situation, there could be any number of

construction battalions or similar army units under the operational control of each AWCM. [Ref. 2 and Ref. 3].

5. Contract Construction Assets

The agencies providing contracting support to the RWCM and his AWCM will be the Officer in Charge of Construction, Mediterranean (OICC MED) and the Officer in Charge of Construction, Southern Europe (OICC SOEUR). The two OICCs will provide the necessary contract plans and specifications development, solicitation, award and contract administration. Figure 2 illustrates the overall RWCM organization, showing the relationships among all the members.

C. MISSION

The RWCM is a conductor who orchestrates the entire construction effort in the assigned regions. He establishes priorities, assigns the construction resources, and monitors the action to ensure that the construction needs are met.

1. Peacetime

During peacetime, when the RWCM-MED function has not been activated, there are no specific duties beyond preparation for the wartime role. The major construction effort within the regions is performed under the normal NATO and DOD Military Construction programs.

2. Transition to War

There is a period prior to complete mobilization of RWCM-MED (including Deputies), AWCM, and troop construction units. During this period the CINCUSNAVEUR Fleet Civil

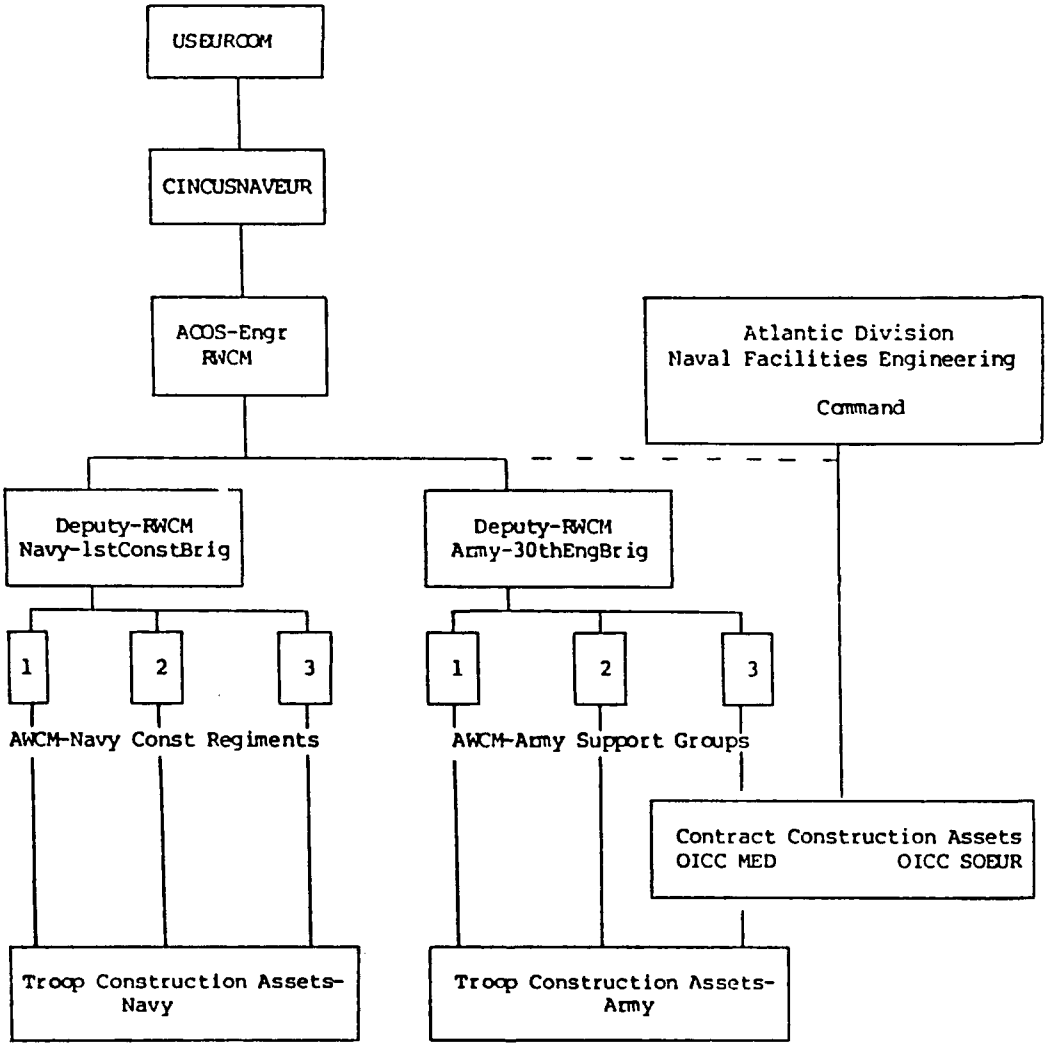

USEURCOM
CINCUSNAVEUR
ACOS-Engr
RWCM
Atlantic Division
Naval Facilities Engineering
Command
Deputy-RWCM
Navy-1stConstBrig
Deputy-RWCM
Army-30thEngBrig
1
2
3
1
2
3
AWCM-Navy Const Regiments
AWCM-Army Support Groups
Contract Construction Assets
OICC MED
OICC SOEUR
Troop Construction Assets-
Navy
Troop Construction Assets-
Army

FIGURE 2

Engineer (FCE) functions as the RWCM, utilizing the normal peacetime resources, existing in-place assets, and on-hand reserve personnel. The construction support needed during this phase would include primarily bed-down (preparation for war) and war damage repair.

3. Wartime

a. Ongoing RWCM Tasks

There are five major tasks that the RWCM performs throughout the transition and war/contingency phases. These tasks are to:

1. Collect and maintain construction intelligence for the region, including a current listing of militarily significant facilities, lines of communication and factors that influence construction capability, such as soils, terrain and climate.

2. Collect and maintain information on available construction resources, including a current inventory of U.S. controlled prepositioned construction materials and facility components intended for use in the Mediterranean region.

3. Maintain a current inventory of military and civilian construction capability currently available, including that capability which is potentially available from host nation assets.

4. Maintain a listing of the basic building materials and assets used in the region, such as lumber, bricks, aggregates, ready mix plants, asphalt plants, etc. and their potential availability.

5. Maintain the current status of troop construction assets to be made available by component commanders, including Army Corps of Engineer construction battalions, Naval Construction Force units and Air Force RED HORSE squadrons. [Ref 1, pp. 2-3]

b. Additional RWCM Tasks After Activation

There are eight additional tasks which the RWCM will perform after activation.

1. Integrate all component commander's requirements for construction into a time-phased priority list that reflects current construction needs.

2. (Continue to) maintain current information on the capacity of available construction assets (host nations, contract construction and troop construction) to provide military construction support where needed.

3. Coordinate the use of Host Nation Construction Assets in accordance with bilateral agreements or other arrangements, to ensure that existing host nation facilities and construction resources are used in a way which optimizes the total construction effort.

4. Assume OPCON (operational control) of all DOD CCA's (contract construction assets) in the Mediterranean region.

5. Assume OPCON of TCA's (troop construction assets) when directed by USEURCOM or when made available by the component commanders but not later than D+60 (60 days after a war or contingency begins).

6. Monitor real estate activities in the region to ensure that real estate actions meet construction needs.

7. Provide periodic reports concerning projects status and estimated completion dates to the component commanders.

8. Develop SOP's (standard operating procedures) for coordination between RWCM-MED (AWCM), TCA's and CCA's. [Ref. 1, pp. 3-4]

c. Project Priority

The RWCM must consider a variety of issues to properly allocate construction resources for projects. Some of these items are military battle plans, tactical priorities, construction manpower availability, and available construction resources. One of the most important issues to be considered

is the actual priority ranking of the project as assigned by the component commanders. There are three project priorities.

1. **Priority One.** A project that, if omitted, would inflict high penalty costs in loss of life and early defeat of friendly forces. These projects include the repair of damage to critical operational facilities (e.g., tactical airfields and APODS); those which increase the mobility of friendly forces (e.g., repair to bridges or Main Supply Routes (MSR), and minimum construction of essential facilities for bed-down of combat operations forces); and those increasing survivability of friendly forces (e.g., defensive positions for air defense weapons).

2. **Priority Two.** A project that, if omitted, would seriously degrade combat effectiveness, increase vulnerability on the battlefield, increase probability of tactical defeats, and degrade sustainability. These projects include construction of secondary defense positions, construction or repair of medical facilities, and minimal restoration of MSR, tactical airfields and APODs.

3. **Priority Three.** A project that, if omitted, would degrade quality of combat service support, degrade long term sustainability, produce equipment/material losses, and have minor impact on tactical operations. These projects would include work such as follow-on restoration of base facilities, lines of communication and main supply routes and new construction of initial standard base facility. [Ref. 1, pp. N-4,N-5]

In this chapter, the RWCM's areas of responsibility were defined and the organization and mission were described. The next chapter examines the pertinent funding policies of the RWCM organization.

III. CONSTRUCTION FUNDING

A. INTRODUCTION

1. General

Operations and Maintenance (O & M) and Military Construction (MILCON) are the two primary funding sources used for contingency construction. During peacetime, each component commander has the authority to spend up to $200,000 of O & M funds for a single construction project. Any single project which costs more requires specific appropriated funds from Congress (MILCON). As a general rule, O & M funds should be used whenever possible. In this chapter, O & M and MILCON funding policies will be discussed, as well as the management of project funds. The primary source of information for this chapter is USEURCOM Directive 61-4 [Ref. 4].

2. Contingency Duration

In this context, a contingency is categorized as lasting for either a short duration (up to 180 days) or long duration (over 180 days). Each situation involves different approaches to satisfy the related construction requirements. This distinction will determine whether O & M funds or MILCON funds are used.

a. Short Duration

Facility requirements for operations of short duration will normally be met by using existing facilities,

mobile equipment, expedient construction, and erection of portable or relocatable facilities. Available O & M funds will be used to the maximum extent possible. MILCON funding will not normally be required.

b. Long Duration

Long duration contingencies require construction of the type and scope normally funded through the MILCON process. However, the value of construction should be kept to the minimum necessary for the efficient fulfillment of operations. Each component commander should, first, use his O & M funds to the maximum extent possible before using MILCON funds for construction as necessary. If requirements exceed the component commander's funding capability, the military department and the regional Area Wartime Construction Manager should be contacted.

B. CONTINGENCY/WARTIME FUNDING

1. O & M Funds

To offer some relief in the early stages of a contingency, USEURCOM will consider requesting from JCS and the various military departments that the O & M expenditure authority limit of $200,000 be raised to $1 million. If sufficient O & M funds are not available within DOD to meet certain requirements, DOD may invoke Section 3732, 41 USC 11 [Ref. 5]. This statute authorizes the Secretary of Defense to make obligations on a deficiency basis. Congress requires only notification.

2. MilCon Funds

In many instances, MILCON projects will be required even if the O & M limit is raised to $1 million per project. There are always significant amounts of appropriated MILCON funds, not yet obligated, to meet these contingency requirements. Title 10 USC Section 2808 authorizes the Secretary of Defense, in the event of a declaration of war or national emergency, to use any available unobligated military construction funds (including family housing funds) for contingency construction purposes [Ref. 6]. Reprogramming or deobligating of MILCON funds that have already been committed would be employed only if unobligated funds were insufficient, as these action require longer processing times. However, component commanders will take the necessary action to reprogram or deobligate, time permitting. The Secretary of Defense also possesses the authority (through Title 10 USC Section 2803) to spend up to $30 million annually to accomplish any contingency construction requirements not otherwise authorized by law [Ref. 7].

C. MANAGEMENT AND ACCOUNTABILITY

As previously noted, the RWCM produces and maintains a prioritized list of construction projects for the different areas within his region. These requirements, as well as construction assets, are managed by the Area Wartime Construction Manager (AWCM) within the region. Before any construction takes place, either by troop assets or contract

assets, each project must first be funded. The RWCM will consolidate all projects desired to be constructed under Section 2808 funding (appropriated, but not obligated). Once the AWCM and the component commanders have been identified all requirements, the RWCM makes the submission to the JCS. Even though the RWCM requests the funds, the funds will flow directly to the component commanders and not to the RWCM. Once the component commanders receives funds, they submit the required projects to the AWCM for execution. Each component commander and troop construction asset will maintain all fiscal accountability and responsibility. Also, they will use their own internal assets to carry out these duties and not depend on the RWCM organization.

IV. REGIONAL WARTIME CONSTRUCTION MANAGER ORGANIZATION COST

A. INTRODUCTION

The Regional Wartime Construction Manager and his organization have never been mobilized and put into place. Therefore, actual information about the cost to operate this organization is not available. This chapter will attempt to formulate this organization's cost once it has been activated.

As previously stated, the primary responsibility of the RWCM organization is to manage the construction program during a war or other contingency. The total cost involved in operating a construction organization includes a variety of cost factors, such as labor, materials, equipment and overhead. However, the RWCM provides only a management service, and, therefore, this chapter will focus on the cost of its management activities. This assessment will include the RWCM's labor and overhead costs but will not address the total cost of construction.

B. PERSONNEL

There are four layers to the RWCM organization: the RWCM staff, the deputy RWCMs, the AWCMs, and the construction units. Each unit has a specific number of personnel, by pay grades, who will fill the authorized billets. Therefore, it is not difficult to calculate the labor cost involved at each level. However, it is uncertain exactly how many units would be

mobilized, because this depends on a given contingency. This thesis assumes that all of the personnel in the staff, deputy and AWCMs units would be mobilized. Furthermore, according the Army Corps of Engineer study [Ref. 3], ten troop construction units would be activated.

Table 4-1 shows the actual numbers, ranks and direct labor costs of the personnel that are presently authorized in the Navy units. The annual direct labor costs for these personnel are $612,044,868. Only the Navy units in the RWCM organization have been included in the assessment. Comparable information regarding the Army Deputy RWCM, AWCMs and troop construction units is not provided. However, discussions [Ref. 2] with the RWCM staff suggest that the Army's personnel staffing is similar to the Navy; consequently, their direct labor costs would be similar too.

C. OVERHEAD

The overhead cost of this organization is difficult to determine since these units have never been activated and no actual data are available. However, there are some existing organizations which perform services similar to those of the RWCM staff, the deputy and the AWCM. The Officers in Charge of Construction (OICC) for the Mediterranean offices in Sigonella, Sicily; Naples, Italy; and Rota, Spain all manage and administer construction projects. Two factors, though, require a note of caution regarding the suggested comparison. First, these OICC contract offices simply manage and administer

REGIONAL WARTIME CONSTRUCTION MANAGER-MEDITERRANEAN
DIRECT LABOR COST (NAVY UNITS ONLY)

TABLE 4-1

RWCM STAFF (1 Unit)

RANK	NO.	ANNUAL COST*	RANK	NO.	ANNUAL COST
O7	1	$ 78,396	E7	2	$ 50,592
O6	8	$ 490,368	E6	6	$ 277,416
O5	12	$ 624,240	E5	6	$ 108,360
O4	11	$ 463,056	E4	3	$ 47,340

Total Staff Cost..... $2,139,768

DEPUTY RWCM (1 Unit)

RANK	NO.	ANNUAL COST	RANK	NO.	ANNUAL COST
O8	1	$ 78,396	E9	1	$ 35,148
O6	11	$ 674,256	E8	2	$ 59,832
O5	12	$ 624,240	E7	8	$ 202,368
O4	9	$ 378,864	E6	7	$ 323,652
O3	3	$ 105,084	E5	13	$ 234,780
O2/1	2	$ 52,032	E4	15	$ 236,700
			E3-1	11	$ 149,952

Total Deputy Cost..... $3,155,304

AWCM (3 Units)

RANK	NO.	ANNUAL COST	RANK	NO.	ANNUAL COST
O6	1	$ 61,296	E9	1	$ 35,148
O5	2	$ 104,040	E8	3	$ 89,748
O4	4	$ 168,384	E7	10	$ 252,960
O3	4	$ 140,112	E6	6	$ 277,416
W3	1	$ 34,032	E5	6	$ 108,360
			E4	17	$ 268,260
			E3-1	8	$ 109,056

Total AWCM Cost..... $4,946,436

TABLE 4-1 CONTINUED

TROOP CONSTRUCTION UNITS (10 Units)

RANK	NO.	ANNUAL COST	RANK	NO.	ANNUAL COST
O5	8	$ 416,160	E9	10	$ 351,480
O4	10	$ 420,960	E8	18	$ 538,488
O3	33	$1,155,924	E7	64	$ 1,618,944
O2/1	17	$ 442,272	E6	182	$ 8,414,952
W3	3	$ 102,096	E5	316	$ 5,706,960
			E4	363	$ 5,728,140
			E3-1	381	$ 5,193,792

Total Troop Cost..... $ 601,803,360

Grand Total..... $ 612,044,868

* Sources of Data:

1. Numbers of on-board allowances were taken from Naval Reserve Unit Assignment Documents (RUADs) from actual units which would be mobilized to the RWCM organization.

2. January 1990 Military Pay rates including Basic Pay and Housing Allowance (with dependents)
   - Admiral (RADM/VADM) over 22 years service
   - Captain (CAPT) over 20 years service
   - Commander (CDR) over 16 years service
   - Lieutenant Commander (LCDR) over 10 years service
   - Lieutenant (LT) over 4 years service
   - Lieutenant Junior Grade (LTJG) over 2 years service
   - Ensign (ENS) less than 2 years service
   - Chief Warrant Officer (CWO) over 16 years service
   - Master Chief Petty Officer (E9) over 20 years service
   - Senior Chief Petty Officer (E8) over 16 years service
   - Chief Petty Officer (E7) over 10 years service
   - Petty Officer First Class (E6) over 6 years service
   - Petty Officer Second Class (E5) over 4 years service
   - Petty Officer Third Class (E4) over 3 years service
   - Seaman (E3-1) less than 2 years service

construction contracts and do not possess any troop construction assets. Second, there may be a great difference between peacetime costs and contingency or wartime costs.

The Sigonella, Naples and Rota operations were chosen because they completed the largest dollar amounts of construction in the Mediterranean area in fiscal year (FY) 1990. Sigonella completed $11.4 million of construction in FY 90, Naples completed $4.2 million, and Rota completed $2.2 million. The basis which the Naval Facilities Engineering Command uses to charge for construction contract supervision, inspection, and overhead costs (SIOH) is a percentage of the construction contract value. Overseas customers in the Atlantic division, including the Mediterranean, are charged 6.5%. *This method cannot* be utilized in our assessment of the RWCM cost because the amount and value of the wartime construction is not known. However, what is known about the RWCM is the annual labor costs. So, the approach here is to calculate the overhead costs of the OICC offices as a percentage of their annual labor costs and apply that rate to the RWCM staff, deputy and AWCM units. This approach would not lend itself to the construction units because OICC offices do not actually perform the construction work. [Ref. 8]

The following table shows the annual labor costs, overhead costs and resultant overhead rate of each of the three OICC Mediterranean offices:

UNIT	ANNUAL LABOR COST	ANNUAL OVERHEAD COST	RATE
Sigonella	$336,000	$165,000	49%
Naples	$235,000	$83,000	35%
Rota	$247,000	$55,000	22%

As can be seen, the overhead rates of these organization vary widely, from 22% to 49%. Using this approach to cost estimation, the overhead cost of the RWCM (staff, deputy, and AWCM) organization would range from 22% to 49% of its annual labor costs. The following table illustrates the resultant ranges of direct labor, overhead and total costs of operation (in thousands of dollars):

UNIT(s)	LABOR COST	OVERHEAD RANGE	TOTAL COST RANGE
RWCM	$2,139	$ 470 - $1,048	$2,610 - $ 3,188
DEPUTY	$3,155	$ 694 - $1,546	$3,849 - $ 4,701
AWCM	$4,946	$1,088 - $2,423	$6,034 - $ 7,369
			$12,493- $15,258

The total cost to operate the RWCM organization (excluding the troop construction assets) might range from $12,493,000 to $15,258,000. However, since the overhead rates have such a wide range, the figures developed from this method should not be considered reliable. The Sigonella office, for example, completed $11.4 million of construction but had a higher overhead rate than those offices completing lesser amounts of construction. Usually the opposite findings would be expected. Without a complete breakdown of fixed and variable overhead costs for the three offices, however, it is impossible to do a more complete analysis.

V. CONSTRUCTION RESOURCE COST MODEL AND WARTIME CONSTRUCTION EXERCISE

A. MODEL

1. Introduction

In a major war or contingency situation, there will be extensive amounts of construction requirements during the conventional bed-down, war damage repair and on-going maintenance periods. Regardless of whether it is a short or long duration contingency, the management of these requirements will, at many times, overwhelm the construction manager in the field. It is for this reason that a cost model is needed. By the use of this tool, the AWCM can evaluate the cost of these construction requirements. "Cost" in this context is not limited to the amount of dollars spent on these projects, but, on the full cost of required resources. This cost model will help the manager assess the full cost of his resources, which include all of his assets, such as labor, materials, equipment, and so forth.

This model does not claim to be able to make a complete and total cost assessment. However, the model is flexible enough that the extent of resources that can be determined is limited only by the manager's experience, the information available, and the time he has to make the assessment.

This chapter will develop the Resource Cost Model and demonstrate its use. Furthermore, an exercise scenario will be developed for the model as a training tool for the RWCM organization.

2. Model Characteristics

The model is a heuristic process consisting of five basic questions that must be answered before any requirement evaluation is complete. This step-by-step analysis must be performed to determine what the project or requirement is, where the project is needed, when the project is needed, who can complete it, and how it will get accomplished. It is after the "what, where, when, who and how" have all been established that the resource variables are known and construction can begin. In many cases this process could take several days to perform. In a contingency situation, however, it may have to be done in just a few hours. The model is further described in the following paragraphs.

a. What

Generally, identification of what the requirements are is not a problem. During the bed-down process, actual contingency, and finally the maintenance period, the component commanders will be identifying what construction requirements are needed at their bases. Their project requests could come in many different formats. Most often the component commander will send the request by message. Projects will sometimes be identified by JCS Category and/or

NAVFAC Component codes. They will also be ranked by priority 1, 2 or 3 as described in Chapter II. These projects are further sub-divided within those three priority levels by task codes. These codes are partially described below. A more thorough list with the JCS and NAVFAC codes for each task is found in the Appendix. A complete definition of NAVFAC Codes can be found in NAVFAC P-437 Facilities Planning Guide, Volume II [Ref. 3].

PRIORITY 1

TASK

1. War damage repair of piers, wharves, waterfront operating buildings and electrical generation facilities
2. Emergency repair of runways, taxiways, and parking aprons
3. War damage of runways, taxiways, parking aprons and helicopter landing pads
4. War damage repair of Petroleum, Oil, and Lubricant (POL) pipelines
5. War damage repair of POL storage sites
6. War damage repair of ammunition storage sites
7. Construction of water storage facilities
8. War damage repair of existing water storage facilities
9. Site preparation for fleet hospitals and where specific requirements for Advance Base Functional Components (ABFCs) have been pre-identified but where none are deployed, construction of austere medical facilities
10. Construction of austere helicopter landing pads, taxiways, parking aprons, aircraft revetments, structure-hardening revetments, maintenance hangars, airfield facilities, fire stations; and where specific requirements for an ABFC has been pre-identified but where none is being deployed, construction of an austere photographic laboratory

11. Construction of decontamination sites and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of austere decontamination stations/sites for decontamination of ships exposed to NBC warfare

12. Well drilling operations

13. Mooring construction and placement in the Mediterranean

14. War damage repair of main supply routes (MSRs)

15. Construction of an Advanced Logistics Support site(ALSS)

16. Quarry operations

17. Asphalt plant operations

PRIORITY 2

TASK

18. Construction of port communications and cargo handling facilities, erection of deployed ABFCs, and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of various austere port communications and cargo handling facilities.

19. War damage repair of MSRs on other than the island of Sicily

20. Construction of marshalling yards

21. Construction of POL storage and dispensing facilities, erection of deployed ABFCs, and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of various austere POL facilities

22. Construction of open and covered ammunition storage sites

23. War damage repair of railroad tracks and bridges

24. Construction of base camp facilities, including emergency messing and berthing, administrative facilities, confinement facilities, perimeter physical security, electricity source and distribution systems, and water treatment facilities; erection of deployed ABFCs; and, where specific requirements for austere base support facilities

25. Construction of maintenance facilities and shops--organizational maintenance, engines, vehicles, weapons, electronic/communications, avionics, parachutes/dinghies, and base facilities; erection of deployed ABFCs; and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of various austere maintenance facilities

26. War damage repair of maintenance facilities

27. Erection of deployed ABFCs for airfield/heliport maintenance, and where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of various austere airfield/heliport support facilities

28. Fire-fighting operations

PRIORITY 3

TASK

29. Expansion of existing fixed-wing runways

30. Construction of POL pipelines

31. Maintenance of MSRs

32. Construction of access roads

33. Construction of base and depot storage facilities-Cold, covered, and open storage, and austere hardstands; erection of deployed ABFCs; and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of austere supply support and refrigerated storage facilities

34. Operation and maintenance of base facilities; general public works

35. War damage repair and maintenance of access roads

36. War damage repair of administrative and storage facilities--depot and base covered storage, and depot and base open storage

37. Construction of emergency mass grave sites

38. War damage repair to troop camps

39. War damage repair to hospitals [Ref. 3]

b. Where

Once the work has been identified, the next step is to determine where the work is to be accomplished. This step seems to be simple enough because one will probably know where the component commander is located. His desired projects will probably be at his installation or nearby. However, not all of the projects will be on a particular government installation. Some projects could be new mooring facilities at a commercial pier, communications equipment at some remote location, or a troop camp in the middle of the frontier.

c. When

It is also helpful to know when the work needs to be accomplished. The problem, however, is that requirements will usually be requested with no specific completion date. Without any particular guidance from the component commander (other than "as soon as possible"), the priority ranking can indicate a sequence or at least demonstrate the criticality of the specific project.

d. Who

This next step is a very important one. In this part of the heuristic, the decision will be made to accomplish the work either by troop construction assets or construction contract. Every request that arrives from the component commander should indicate an estimate of how many construction hours are required to complete the task. Generally, this estimate will be divided into manhours by these three

construction skills: horizontal, vertical, and general labor support. These skill divisions are described below.

1. Horizontal personnel are operators of equipment, including bulldozers, dump trucks, graders, cranes and other heavy equipment.
2. Vertical personnel include carpenters, plumbers, steel workers and electricians.
3. General labor support are those individual without a specific construction skill.

Once the number of construction manhours is known, then an assessment is required of troop construction assets. Every AWCM will know what construction assets he has available. More importantly, he must know their daily rate of construction accomplishment. Daily rates may be very general estimates, or the AWCM may have specific figures. Such data are necessary in order to determine whether or not the requirements will be completed by troop construction.

The process can proceed in a variety of ways. One way is to divide the required number of manhours of construction by the rates of available construction assets. This shows how many construction units it will take to complete the requirement. Now, because each AWCM will have various sizes of construction units available, this method can show whether he has the assets to accomplish the work. For example, a SEABEE battalion could have 700 to 1400 men. There also may be specialty detachments formed for particular jobs, like Rapid Runway Repair (RRR). A detachment could range from 10 to 200 or more men.

Another way to proceed is to divide the known construction rates of the assets into the actual manhour requirements. This demonstrates how long it will take to accomplish the work with given personnel resources. Also, if another project must begin in the near future, the possibility of it delaying previous projects, or vice versa, can be seen. There are many other factors which can influence whether or not a project should be assigned to the troops. Issues such as availability of equipment, materials, and specific construction skills are but a few. These other influences are discussed further in the final step of the model.

e. How

If the availability of troop construction assets were the only concern in this process, the management focus would certainly be narrower. However, there are many other resources required to get a project done. This final step will address how the work will be accomplished and, thus, determine what the costs will be.

1. Labor. The amount of labor required to complete construction tasks was mentioned above. However, having the proper skills available is essential. Most construction battalions possess a full range of construction skills. However, a requirement could demand a specialty skill, such as water well drilling, rock blasting, or high voltage electrical work. Some small or even large detachments may not possess these construction skills.

2. Materials. Having the necessary construction materials available is crucial. In a short duration contingency, most of the construction needs will be met by existing buildings or other facilities, on-hand materials or satisfied by the erection of pre-positioned portable

facilities such as Advanced Base Functional Components (ABFCs).

3. Equipment. The availability of proper tools, construction and transportation equipment at the right locations is also essential. Again, many of the major construction units possess a large amount of equipment. However, the smaller units might not have the full range of construction equipment. Also, equipment is not always available because of break-downs or scheduled maintenance.

4. Transportation. When a project is located at a remote site or somewhere not convenient to where the construction units are located, consideration must be given to how the troops, materials and equipment are going to get there.

5. Environmental conditions. There are various circumstantial factors which can impact on the manager's ability to complete the required construction. They will affect costs because they will influence the pace and ease with which construction work can be accomplished. Some of these factors are weather conditions, troop morale, host nation relations, and the presence and proximity of a hostile threat.

B. MODEL EXAMPLE

To illustrate how this model is used, this section will walk an example through the process. It is a limited example, but it will be sufficient to demonstrate the model and show the importance of a tool of this kind.

1. Projects

The following is a typical message which an AWCM might receive from one of the component commanders in his region. This message contains requirements covering the first ten days of a contingency. Actually, these projects are "bed-down" requirements, as denoted by the "B" suffix to the JCS CAT CODE.

ADMINISTRATIVE MESSAGE
[In an actual message, this would be classified, SECRET]
R280323Z APR 92
FM: NSA TANGO
TO: AWCM FOUR
BT
//N03121//
SUBJ: CONSTRUCTION REQUIREMENTS
A. USEURCOM DIR 61-4
1. IAW REF A, THE FOLLOWING REQD CONST PROJECTS ARE SUBMITTED FOR SCHEDULING AND COMPLETION. ALL PROJECTS ARE FUNDED. ACCTG DOCS TO FOLLOW. PROJS ARE IN PRIORITY ORDER BY PRTY CODE.

PRTY CODE	TASK NO.	JCS CAT CODE	HORIZ HRS	VERT HRS	GEN'L HRS	QTY	TOTAL HRS
1	7	841CB	19	5	6	1470	30
1	7	841CB	61	431	0	1617	492
1	12	841AB	119	749	784	2.9	1652
2	18	153BB	150	350	370	4850	870
2	24	725AB	63	672	197	7350	932
2	24	725BB	42	326	278	1323	646
2	24	811AB	30	285	303	147	618
2	24	811AB	10	33	33	1470	76
	T O T A L		494	2851	1971		5316

BT

2. What

There are eight projects that have been submitted to the AWCM, three priority 1 projects and five priority 2 projects. According to the JCS CAT CODE and TASK CODE definitions, the projects are described below and listed in the original order:

a. Construct a Water Storage Facility for 1470 gallons

b. Construct a Water Storage Facility for 1617 gallons

c. Drill a Water Well with a capacity of 2.9 thousand gallons per day

d. Erect a ABFC D33B Material Handling Facility

e. Construct Emergency Troop Housing of 7350 square feet

f. Construct Emergency Troop Messing of 1323 square feet

g. Provide 147 Kilowatts of Electrical Power.

h. Provide 1470 linear feet of Electrical Distribution

3. **Where**

All of these projects are located at or near the Naval Support Activity TANGO.

4. **When**

As previously mentioned, an actual completion date has not been provided. However, the projects have been ranked in priority order. Therefore, the first three projects must get priority attention.

5. **Who**

There is one Naval Mobile Construction Battalion near NSA TANGO which is capable of providing 3,060 manhours daily of construction effort. The list of required projects is estimated at 5,316 manhours of construction. Without any consideration to the battalion's current requirements or potential future requirements, the work could be completed within two days - in the absence of other restrictions or unexpected difficulties.

6. **How**

The battalion possesses all required skills necessary to complete the projects. Next, all the required materials are standard to the battalion's allowance or will be on-hand at NSA TANGO. The necessary equipment and needed transportation are also available. Finally, the weather

conditions, troop morale, and other environment factors will not adversely affect the completion of the projects.

C. WARTIME CONSTRUCTION EXERCISE

1. Introduction

The intent of the following exercise is to prepare the reserve RWCM, his Deputies and AWCM organizations for the management of their resources within a contingency environment of less than 180 days. The exercise is designed to be used by these reserve organizations during their normal drill weekend. It is a set of construction and engineering requirements originating from 23 bases or facilities which must be managed by six different Area Wartime Construction Managers. Each of the bases and the responsible AWCM will be described later. Projects include bed-down, war damage repair, and maintenance requirements. The location and amount of troop construction assets will be given. The primary source of the construction and engineering requirements in this exercise was provided by the Engineer Studies Center, US Army Corps of Engineers [Ref. 3].

a. Time Period

The exercise is divided into ten periods. Each period equals ten days. The following table defines each period. D-day is the day on which conflict begins.

PERIOD	D - D A Y S FROM	TO	TOTAL DAYS
1	D-10	D-1	10
2	D-day	D+9	10
3	D+10	D+19	10
4	D+20	D+29	10
5	D+30	D+39	10
6	D+40	D+49	10
7	D+50	D+59	10
8	D+60	D+69	10
9	D+70	D+79	10
10	D+80	D+89	10

b. **Administration**

This exercise is intended to be very flexible. The length of the exercise can last as long or as short as the user desires. It can be completed over a single weekend or last over several, just by controlling the number of messages and how fast or slowly they are delivered to the reserve AWCM units.

c. **Bases and Project Summary**

This exercise consists primarily of construction at naval facilities, with a few minor exceptions. However, it would not be difficult for the person in charge of the training exercise to convert these bases to whichever service he wanted. The following table outlines the AWCM, base designation-type and number of projects used in the exercise:

PROJECT TOTALS - BY PERIOD/BY AWCM

AWCM	BASE	1	2	3	4	5	6	7	8	9	10
1	A-NSA	19	29	18	9	8	7	6	6	6	6
	B-NSA	1	0	0	0	0	0	0	0	0	0
	C-NSA	19	7	7	5	6	4	3	3	3	3
	D-Camp	2	2	0	0	0	0	0	0	0	0
	E-NSA	18	20	10	11	10	3	3	2	2	2
		30	58	35	25	24	14	12	11	11	11
2	F-NSA	1	0	0	0	0	0	0	0	0	0
	G-NSA	1	0	0	0	0	0	0	0	0	0
	H-NSA	1	1	1	0	0	0	0	0	0	0
	I-Camp	5	0	0	0	0	0	0	0	0	0
		8	1	1	0	0	0	0	0	0	0
3	J-NSA	25	7	4	7	8	4	3	3	3	3
	K-NSA	21	19	23	27	12	4	3	3	3	3
	L-NSA	3	0	0	0	0	0	0	0	0	0
	M-NSA	24	28	19	14	10	6	5	5	5	5
	N-NSA	12	2	2	1	2	2	1	1	1	1
	O-NAS	35	67	41	21	13	13	8	9	10	8
	P-AMMO	14	10	19	9	13	16	6	6	7	6
		134	133	108	79	58	45	26	27	29	26
4	Q-NS	7	1	2	1	1	1	1	1	1	1
	R-COM	6	3	5	1	1	1	1	1	1	1
	S-NSA	32	40	21	18	11	7	6	8	7	6
	T-NSA	8	0	1	8	2	7	0	0	0	0
		53	44	29	28	15	16	8	10	9	8
5	U-NSA	1	0	0	0	0	0	0	0	0	0
	V-NSA	0	0	0	1	0	0	0	0	0	0
		1	0	0	1	0	0	0	0	0	0
6	W-NSA	4	3	7	7	3	3	3	3	3	3

The base type definitions are as follows:

NSA - Naval Support Activity
Camp - Army Camp or Complex
NS - Naval Station
NAS - Naval Air Station
AMMO - Naval Ammo Depot
COM - Naval Communication Station

d. Messages

The exercise messages are arranged by time period and by bases. They represent what the AWCM might receive from the component commanders within his region in every period (10 days). The first two digits of the message date identify the period to which the message belongs. The message time of release is left blank to allow the time-structure of the exercise to be flexible. Each requested project is identified by priority code, task code, and JCS category code. Also provided are the estimated horizontal, vertical, general and total construction hours. In most cases, each message identifies a complete project requirement. If a project has a figure of zero under project quantities (SF, KW, etc.), however, this means on-going work. The project will not be completed within the period requested. There are over 150 exercise messages which have been generated for this exercise. However, these messages are not included in this thesis in order to avoid unnecessary redundancy. A complete set of exercise messages may be obtained from Commander in Chief, U. S. Naval Forces, Assistant Chief of Staff - Engineering, 200 Stoval Street, Alexandria, Virginia 22331-2301.

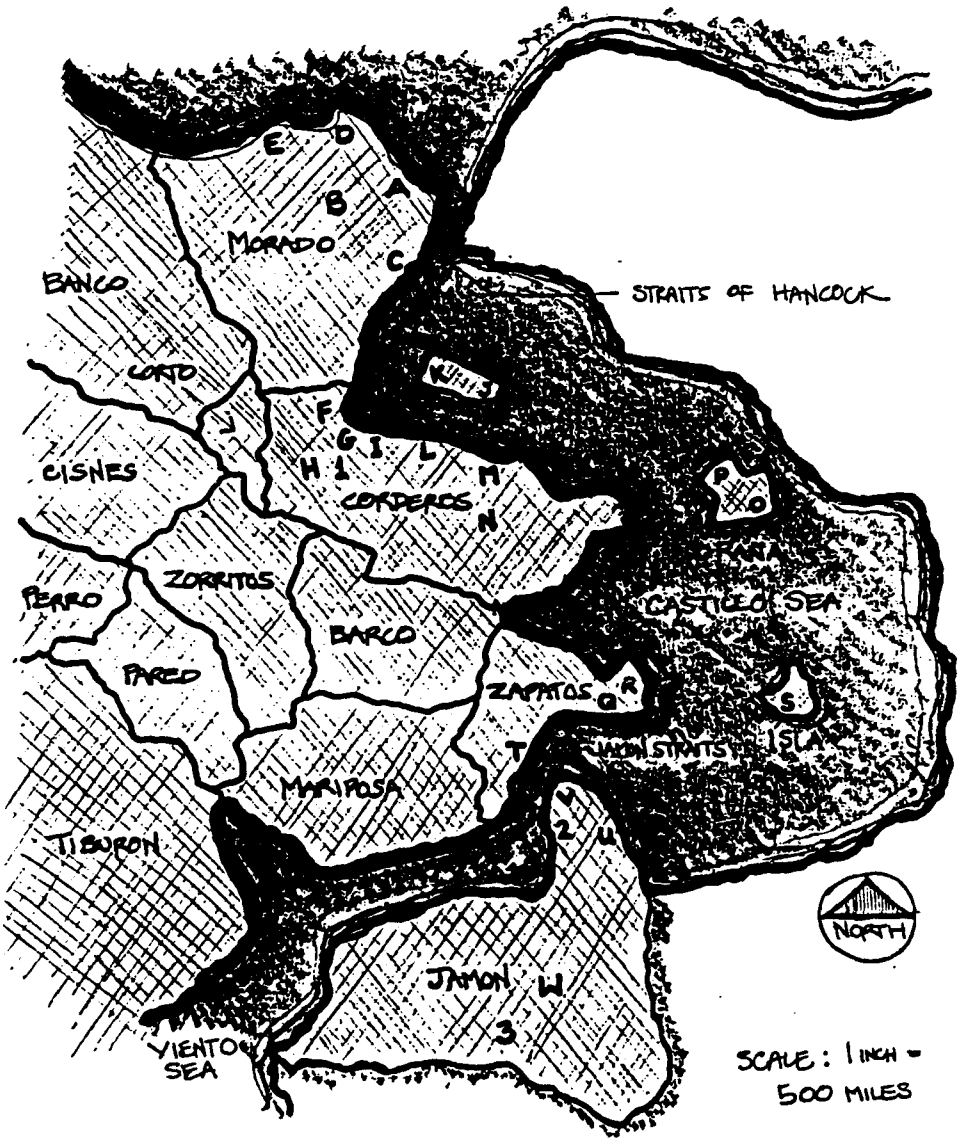
2. Scenario

This exercise scenario is fictitious. All of the names of foreign countries and combat units have been manufactured. The countries of Banco, Morado, Cisnes, Corto, Corderos, Zapatos, and Jamon, all lie within the eastern region

of the continent of Orange. They are all allies with the United States through membership in the Central Orange Strategic Alliance (COSA). Six other countries in the central and western portions of Orange are also members of COSA. This exercise consists of a multi-front conflict limited to warfare in the four major countries in the eastern region of Orange: Corderos, Zapatos, Marado and Jamon. Figure 3 is a map of the scenario area and locates all of the pertinent countries and other geographic landmarks. The scenario begins with mobilization of hostile forces (at day D-40). The first construction requirements for the RWCM arise in the 10-day period preceding the outbreak of war (D-10 through D-1). The actual fighting continues for 75 days, but construction requirements continue for a total of 90 days.

a. **Threat Forces**

The countries of Tiburon, Perro, Pared, Zorritos, Barco and Mariposa are members of the Bolivar Pact, which was established in 1967. The Bolivar Pact (BP) forces have attacked Central Orange (D-day) from the country of Perro through to the country of Cisnes. Concurrently, BP forces from their eastern command (Pared, Zorritos, Barco, and Mariposa) launch an attack in the eastern region of Orange. These BP forces aligned against the Allied Forces Eastern Orange (AFEAST, a component of COSA) have the primary missions of securing the eastern flank of the Orange, controlling the Castillo Sea, diverting COSA forces from supporting Allied



NOTE: (1) LETTERS ARE NAVAL INSTALLATIONS
(2) NUMBERS ARE ARMY INSTALLATIONS

FIGURE 3

Forces Central Orange (AFCENT), and controlling the Jamon straits. To achieve these goals:

1. BP Ground Forces conduct a conventional weapons campaign along four major fronts within the region: West Corderos, Bayonet (Zapatos), Saber (Jamon straits) and Bowser (Southern Jamon). See Figure 4.

2. BP Naval Forces disrupt COSA sea lines of communication (SLOCs) in the Maritime Front, strike COSA warships within the Castillo Sea, and maintain access to the Atlantic Ocean.

3. BP Air Forces achieve air supremacy in the eastern region, neutralize COSA ground bases in Corderos, Zapatos, and Jamon and disrupt COSA reception bases in Marado.

b. **U.S. Forces**

U.S. forces from the Army, Air Force, Navy and Marine Corps are assigned to the region in support of COSA's Allied Forces, Eastern Orange (AFEAST) operations.

1. Army - Two separate infantry brigades and one mechanized infantry division assist AFEAST forward defensive operations. U.S. air defense units provide local air defense support in the West Corderos, Bayonet and Saber fronts.

2. Navy - The U.S. First Fleet naval forces assigned to the Castillo Sea have responsibility for keeping the air and SLOCs open and blocking BP reinforcement and resupply shipping. Their primary missions include gaining and maintaining control of the Straits of Hancock and the Jamon Straits.

3. Air Force - Operating out of Corderos, Zapatos, Morado and Jamon, U.S. Air Force assets have the missions of detecting and intercepting BP aircraft; attaining air superiority near major COSA installations in the region; and neutralizing BP naval forces with the Southern Castillo Sea.

4. Marines - A Marine Expeditionary Force (MEF) and Brigade (MEB) supplement U.S. ground forces in Zapatos and Jamon.

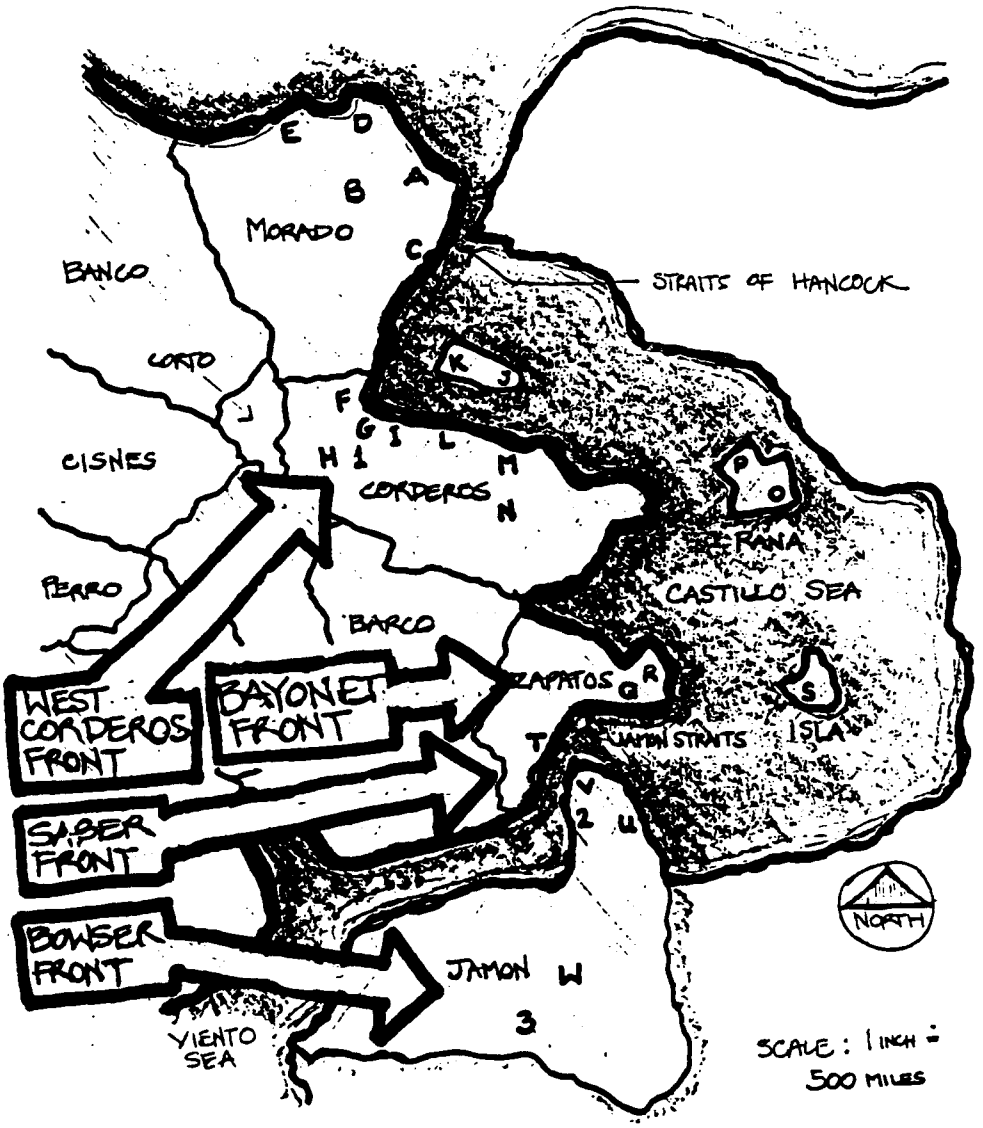

MORADO
BANCO
CORTO
CISNES
PERRO
CORDEROS
BARCO
ZAPATOS
STRAITS OF HANCOCK
PANA
CASTILLO SEA
JAMON STRAITS
ISLA
WEST CORDEROS FRONT
BAYONET FRONT
SABER FRONT
BOWSER FRONT
JAMON
VIENTO SEA
NORTH
SCALE : 1 INCH = 500 MILES

FIGURE 4

3. Scenario Major Events

The following chart outlines the major events of this exercise.

MOBILIZATION DAYS	COMBAT DAYS	MAJOR EVENT
C-30	D-40	Bolivar Pact forces begin mobilization
C-23	D-33	COSA Allied Forces Central declares alert
C-20	D-30	BP eastern command begin full mobilization
C-15	D-25	COSA Allied Forces East declares alert
C-10	D-20	U.S. First Fleet on station in Castillo Sea
C-09	D-19	U.S. President directs the call-up of 200,000 reserves
C+05	D-05	104th Tactical Fighter Wing operational in Morado. BP forces complete mobilization and deployment
C+07	D-03	6277th Air Base Group arrives in Zapatos
C+09	D-01	U.S. Ninth Fleet forward deploys on station in Castillo
C+10	D-DAY	BP forces attack AFCENT BP (East) forces attack AFEAST 4th Tactical Fighter Group arrives in Corderos
C+12	D+02	Detachment 1, 61st Air Force (Corderos), U.S. Air Squadrons arrive in Jamon
C+17	D+07	5277th Air Base Group arrives in Corderos
C+26	D+16	MEF units arrive in Rana
C+28	D+18	1207th Air Base Group arrives in Zapatos
C+46	D+36	U.S. 28th Airborne Division arrives in Morado
C+52	D+42	U.S. MEB arrives in Zapatos
C+62	D+52	U.S. 42nd Infantry Division (M) arrives in Jamon
C+67	D+57	U.S. MEB arrives in Zapatos
C+68	D+58	U.S. 92nd Infantry Division (LT) arrives in Morado
C+72	D+62	U.S. 812th SIB (M) arrives in Zapatos

MOBILIZATION DAYS	COMBAT DAYS	MAJOR EVENT
C+74	D+64	BP forces initiate Chemical Attack against COSA forces in Jamon
C+75	D+65	COSA conduct counter Chemical Attack against BP forces in Jamon
C+77	D+67	U.S. 3rd SIB (M) arrives in Corderos
C+85	D+75	Scenario Ends

4. **Resources**

a. **Manpower**

The following chart list the Navy and Army AWCMs, their locations, and times deployed. Each installation where the AWCMs are stationed can be located on Figures 3 and 4 by their corresponding letter or number. For example, NSA ALPHA is designated by the letter "A" and can be found in the country of Morado.

AWCM	TYPE	REGION	LOCATION	DEPLOYED
1	Naval Const Regiment	Morado	NSA ALPHA	D+14
2	Army Eng Group	West Corderos	FORT ONE	D+18
3	Naval Const Regiment	East Corderos	NAS OSCAR	D+14
4	Naval Const Regiment	Zapatos	NSA SIERRA	D+14
5	Army Eng Group	Northern Jamon	FORT TWO	D+18
6	Army Eng Croup	Southern Jamon	FORT THREE	D+18

Figure 5 list the available Navy and Army troop construction units, their locations, daily construction capabilities and deployment dates. Each of the construction units can also be located by its corresponding letter or number on Figures 3 and 4.

b. **Material and Equipment**

All of the necessary materials or ABFCs needed to complete construction have been prepositioned on-site or

AWCM	TYPE	DAILY CONST MANHOUR RATE	BASE LOCATION	DEPLOYED
1	Naval Const Battalion	3,060	NSA ECHO	D+20
1	Naval Const Battalion	3,060	NSA ALPHA	Forward
1	Naval Const Battalion	3,060	NSA ALPHA	D+21
1	RRR Det (184 pers)	1010H/490V	NSA ALPHA	D-4
1	Utility Det (122 pers)	210H/810V	NSA ALPHA	D-4
1	Struct Det (122 pers)	180H/700V	NSA ALPHA	D+14
1	General Det (162 pers)	630H/690V	NSA ALPHA	D+14
2	Army Eng Battalion	3,060	FORT ONE	D+18
2	Army Eng Battalion	3,060	FORT ONE	D+23
2	Army Eng Battalion	3,060	FORT ONE	D+25
2	Army Eng Battalion	3,060	FORT ONE	D+29
2	Army Eng Battalion	3.060	FORT ONE	D+45
3	Naval Const Battalion	3,060	NSA MAMA	D+14
3	RRR Det (184 pers)	1010H/490V	NSA MAMA	D-5
3	Struct Det (122 pers)	180H/700V	NSA MAMA	D+14
3	General Det (162 pers)	630H/690V	NSA MAMA	D+14
3	Naval Const Battalion	3,060	NAS OSCAR	D+14
3	Naval Const Battalion	3,060	NAS OSCAR	D+14
3	Naval Const Battalion	3,060	NAS OSCAR	D+14
3	(2) RRR Dets (184 ea)	1010H/490V	NAS OSCAR	D-4
3	Utility Det (122 pers)	210H/810V	NAS OSCAR	D-4
3	(2) Struct Det (122 ea)	180H/700V	NAS OSCAR	D+14
3	General Det (162 pers)	630H/690V	NAS OSCAR	D+14
3	Naval Const Battalion	3,060	NAD PAPA	D+41
4	Naval Const Battalion	3,060	NSA SIERRA	D+14
4	Naval Const Battalion*	3,060	NSA SIERRA	D+14
4	Naval Const Battalion*	3,060	NSA SIERRA	D+14
4	RRR Det (184 pers)	1010H/490V	NSA SIERRA	D-4
4	Utility Det (122 pers)	210H/810V	NSA SIERRA	D-4
4	Struct Det (122 pers)	180H/700V	NSA SIERRA	D+14
4	Naval Const Battalion	3,060	NSA TANGO	D+39
5	Army Eng Battalion	3,060	FORT TWO	D+25
5	Army Eng Battalion	3,060	FORT TWO	D+29
5	Army Eng Battalion	3,060	FORT TWO	D+29
5	Army Eng Battalion	3,060	FORT TWO	D+31
6	Army Eng Battalion	3,060	FORT THREE	D+25

FIGURE 5

Notes: (FOR PREVIOUS FIGURE 5)

1. * units are reserved for marine support and are not available for AWCM use.

2. Definitions:

Const	Construction
RRR	Rapid Runway Repair
DET(s)	Detachments
pers	personnel
1010H/490V	1,010 hours of horizontal construction and 490 ours of vertical construction
Eng	Engineer
ea	each
NSA	Naval Support Activity
FORT	(army installation)
NAS	Naval Air Station
NAD	Naval Ammunition Depot

are readily available in the local economy. Each Construction or Engineer Battalion has its full complement of heavy and light equipment. All specialty detachments possess those pieces of equipment relevant to their particular tasks (i.e. Rapid Runway Repair Detachment will have graders, dump trucks, dozers, rollers, etc.).

c. **Environmental Conditions**

Each installation where construction is required should be prepared for enemy attack both by conventional and chemical weapons. The morale of the construction troops is an important consideration. However, the AWCM will have only a limited amount of direct influence on their morale. This influence is in areas such as work overload and supply support.

The following will describe the Terrain and weather conditions:

1. Morado. Most of the bases (A, B, C, D and E) are located near the coast and are surrounded by moderate mountain ranges. Morado is divided horizontally by Latitude 45 degrees north. The elevation at NSA ALPHA is 2,188 ft. Average daily temperature in January is 47F (max) and 33F (min). The maximum and minimum temperatures in July are 87F and 62F. Average annual precipitation is 16.5 inches.

2. Corderos. Most of the bases are scattered along the northern coast. There is a large mountain range which bisect the country running east and west. The coastal areas are hilly. The island of Rana belongs to Corderos. The elevation at NSA LIMA is 377 ft. The average daily temperature in January is 54F (max) and 39 (min). The maximum and minimum temperatures in July are 88F and 64F. The average annual precipitation is 29.5 inches.

3. Zapatos. All of the naval installations are located along the coast of the Castillo sea. The country is generally covered with small to moderate mountains. The island of Isla belongs to Zapatos. The elevation of NAVSTA Quebec is 351 ft. The average daily temperature in January is 54F (max) and 42 (min). The maximum and minimum temperatures in July are 90F and 72F. The average annual precipitation is 15.8 inches.

4. Jamon. Two of the naval installations (U and V) are located on the northern coast near the Jamon straits. NSA Whiskey is located practically in the center of the country. The countryside is fairly flat except the coastal mountains at the north. The elevation of NSA Uniform is 59 ft. The average daily temperature in January is 64F (max) and 56 (min). The maximum and minimum temperatures in July are 87F and 78F. The average annual precipitation is 85.1 inches.

This chapter has developed the Resource Cost Model to enable the RWCM to assess the total impact of his requirements and has provided an example of its implementation. Also, an exercise scenario was developed for use as a training tool for the RWCM organization.

VI. CONCLUSION

This thesis was undertaken to prepare a training exercise scenario for the Navy's Regional Wartime Construction Manager - Mediterranean (RWCM-MED). To aid in this training exercise of the management of resources, a Resource Cost Model was developed. In order to provide a context for the use of such a model, the following questions needed to be answered first:

1. What kinds of construction funds are used in the execution of the RWCM's duties?
2. If Military Construction funds are required, what are the current procedures in place for contingency situations? Will this current process be effective in a short duration *contingency* (180 days or less)?
3. How is the RWCM responsible for administering these funds?
4. What are the costs required to operate this organization upon mobilization?

A. SUMMARY

Based on the analysis of the USEURCOM directives and U.S. Code, it was determined that there are two primary funding sources used in contingency construction: Operations and Maintenance (O & M) and Military Construction (MILCON) funds. During peacetime, every component commander has the authority to spend up to, but not to exceed, $200,000 for a single construction project. Any project which exceeds that ceiling requires appropriated MILCON funds. It is expected that

USEURCOM will request that this ceiling be raised to $1 million in the early stages of a contingency. When sufficient O & M funds are not available, Title 41 U.S. Code authorizes the Secretary of Defense to obligate funds on a deficiency basis for certain emergency items. Regarding MILCON funds, Sections 2803, Title 10 of the U.S. Code authorizes the spending of up to $30 million annually for the accomplishment of any contingency construction. Section 2808, also, authorizes the Secretary of Defense to use any appropriated, but not yet obligated, construction funds in the event of war or national emergency [Ref. 6]. However, construction projects requiring MILCON funds are not expected to be needed during a short duration contingency. The policy in the U.S. Code to provide these funds in a short duration contingency probably would not be implemented. The primary source of construction funding would be O & M. The component commanders, who would have construction requirements, not the RWCM, would be accountable for the construction funds.

The operating costs of the RWCM organization were classified simply as labor and overhead. Based on the analysis of actual reserve manning documents for the RWCM organization, numbers and ranks of personnel were determined and salaries were calculated. It was uncertain how many of the units should be used in the calculation since the number of personnel would depend on how many were mobilized. The assumption was made

that all of the RWCM staff, the Deputy RWCM and the AWCMs would be activated, along with ten fully manned construction units.

The annual direct labor costs for these personnel would be $612 million. Direct assessment of overhead costs was not possible because this organization has never been activated. Actual cost data do not exist. Overhead cost data were obtained from three OICC Mediterranean contract offices. There are similarities between the duties performed by the RWCM organization (excluding the construction units) and the contract offices. Overhead rates for the three offices were calculated in terms of labor dollars, since labor costs were what was known about the RWCM. These overhead rates ranged from 49% to 22% of labor cost. If overhead based on this range of rates is added to labor costs, the total annual cost to operate the RWCM staff, Deputy RWCMs and the AWCMs would be from $12.5 to $15.2 million dollars. In addition, the labor costs alone for the 10 troop construction units would be about $601 million.

A construction resource model was developed for the Regional Wartime Construction Manager. The manager could determine what the requirement was, where the requirement was needed, when it was needed, who could do the construction work, and how the requirement could get accomplished, considering the labor, materials, equipment, transportation and environmental conditions. An exercise consisting of a multi-front conflict limited to warfare in four fictitious countries

was then prepared. The objective of the exercise is to give the six regional AWCMs an opportunity to use the resource cost model in the management of construction requirements and resources in a simulated contingency.

B. RECOMMENDATION

Two recommendations for the RWCM to conduct further study are proposed. The first study would investigate the adequacy of the authorized funding limit of $30 million for contingency construction and the $200,000 O & M limit. The second study would involve the testing and further refinement of the exercise developed in this thesis. The RWCM organization which has never been activated and can not draw on the experience of similar active units. Additional study could aid in the growth of the RWCM and make it more prepared for mobilization.

APPENDIX

[Ref. 3]

TASK CODE DEFINITIONS WITH JCS AND NAVFAC COMPONENT CODES

PRIORITY 1

TASK

1. War damage repair of piers, wharves, waterfront operating buildings and electrical generation facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
151AW	Break Bulk Ammo Pier WDR	15101WD
151CW	Gen'l Cargo Pier WDR	15101WD
151DW	Fueling Pier WDR	15101WD
152AW	Break Bulk Ammo Wharf WDR	15101WD
152CW	Gen'l Cargo Wharf WDR	15101WD
152DW	Fueling Wharf WDR	15101WD
125AW	Buoyant POL Hose Line	12510L
159CW	Waterfront Operating Fac	159CKG
811AW	Elec Power 2-15 WDR	81110AB
811AW	Elec Power 2-200 WDR	81110CU
811AW	Elec Power Trl WDR	81110BA
811AW	Elec Power Plant WDR	81110CW
811AW	Elec Power Plant WDR	81110CV
811AW	Elec Power 3-100 WDR	81110CR
811AW	Elec Power Plant WDR	81110CA
811AW	Elec Power Plant WDR	81110P
811AW	Elec Power Plant WDR	81110CN
811AW	Elec Power 2-100 WDR	81110AP

2. Emergency repair of runways, taxiways, and parking aprons

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
111RW	Runway RRR	1110WD
112BW	Taxiway RRR	1110WD

3. War damage of runways, taxiways, parking aprons and helicopter landing pads

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
111AW	Fixed Wing Runway WDR	11100WD
112AW	Taxiway WDR	11100WD
111CW	Helo Landing Pad WDR	11320A
113AW	A/C Parking Apron WDR	11320A
131EW	Commo Bldg, other WDR	131EKG

4. War damage repair of POL pipelines

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
125AW	POL Pipeline WDR	12500WD

5. War damage repair of POL storage sites

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
411AW	Ship Fuel Sto WDR	12310B
411CW	Diesel Fuel Sto	12310B
411EW	Jet Fuel Sto WDR	12310B

6. War damage repair of ammunition storage sites

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
421AW	Covered Ammo Site WDR	421AKG
425AW	Open Ammo Site WDR	14910E

7. Construction of water storage facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
841CB	Water Sto Facility WDR	84140E
841CB	Water Sto Facility WDR	84140F

8. War damage repair of existing water storage facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
841CB	Water Sto Facility WDR	84140E
841CB	Water Sto Facility WDR	84140F

9. Site preparation for fleet hospitals and where specific requirements for Advance Base Functional Components (AFBCs) have been pre-identified but where

none are deployed, construction of austere medical facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
887BB	250-Bed Fleet Hospital Site Prep	887B1KG
887AB	500-Bed Fleet Hospital Site Prep	887B2KG
887ZB	Austere Equiv to ABFC M10E Casualty Reception Unit	887ZKG
886AB	Austere Equiv to ABFC M11E Blood Bank	886AKG
886BB	Austere Equiv to ABFC M12E Whole Blood Donor Ctr	886BKG
886CB	Austere Equiv to ABFC M13E Preventative Medicine Unit	886CKG
886DB	Austere Equiv of ABFC M14E Ophthalmic Service Unit	886DKG
886EB	Austere Equiv of ABFC M15E 10-bed Dispensary, Mobile	886EKG
886FB	Austere Equiv of ABFC M16E Casualty Staging Area	886FKG
886GB	Austere Equiv of ABFC M17E Dental Company, Mobile	886GKG
886HB	Austere Equiv of ABFC M18E Dental Prosthetic Unit, Mob	886HKG

10. Construction of austere helicopter landing pads, taxiways, parking aprons, aircraft revetments, structure-hardening revetments, maintenance hangars, airfield facilities, fire stations: and where specific requirements for an ABFC has been pre-identified but where none is being deployed, construction of an austere photographic laboratory

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
111CB	Helo Landing Pad	11120B
112AB	Taxiway	11320A
113AB	Parking Apron	11320A
116AB	Wash Rack	11320A
116BB	Compass Calib Pad	116BKG
116CB	Arm/Disarm Pad	11320A
133AB	Control Tower	133AKG
141BB	EOD Facility	141BKG
141LB	Base/Airfield OpsFac	141LKG
149AB	A/C revets	14910C
149EB	Structural Revetments	149EKG
211AB	A/C Maint Hanger	21105D
730AB	Fire Station, A/C Instal	730AKG

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
886LB	Austere Equiv to ABFC P36 RRR Kit	886LKG
887WB	Austere Equiv to ABFC H17F Photo Lab	887WKG

11. Construction of decontamination sites and, where specific requirements for AFBCs have been pre-identified but where none are being deployed, construction of austere decontamination stations/ sites for decontamination of ships exposed to NBC warfare

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
887PB	Austere Equiv to ABFC E27 Decontamination Site	887PKG
888PB	Decontamination Site	888PKG

12. Well drilling operations

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
841AB	Water Well	84150E

13. Mooring construction and placement in the Mediterranean

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
163AB	Mooring Construction	16320S

14. War damage repair of main supply routes (MSRs)

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
888QW	MSR WDR	888QKG

15. Construction of an Advanced Logistics Support site (ALSS)

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
888EB	ALSS Construction	888EKG

16. Quarry operations

17. Asphalt plant operations

PRIORITY 2

TASK

18. Construction of port communications and cargo handling facilities, erection of deployed ABFCs, and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of various austere port communications and cargo handling facilities.

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
131AB	Commo Center	131AKG
131DB	Transmitter Bldg	131DKG
131EB	Commo Bldg-other	131EKG
141MB	Air Freight Terminal	14112G
141MB	ABFC D29A Air Cargo Terminal	141M1KG
141MB	ABFC D29B Air Cargo Terminal	141M2KG
141MB	ABFC D29C Air Cargo Terminal	141M3KG
141NB	Air Passenger Terminal	141NKG
153AB	ABFC P17 Trucking Co.	153A1KG
153BB	ABFC D33B Mat Handling Fac	153B1KG
159CB	ABFC B5A Boat Pool	159C1KG
159CB	ABFC C7A Visual Commo (Min)	159C2KG
888FB	ABFC B13C Port Service Ofc	159C3KG
888GB	ABFC B15D Mil Sealift Com Office	610A5KG
887FB	Austere Equiv of ABFC B15A Mil Sealift Command Office	887FKG
887GB	Austere Equiv of ABFC B16C Control of Shipping Ofc	887GKG
887HB	Equiv C3A ABFC	887HKG
887IB	Equiv C33 ABFC	887IKG
887KB	Equiv D29C ABFC	887KKG
887QB	Equiv E32A ABFC	887QKG
887RB	Equiv F1 ABFC	887RKG
886MB	B15B MSCO (Med)	610A6KG
8860B	Equiv B5A ABFC	8860KG
886RB	Equiv C9 ABFC	886RKG
886VB	Equiv P17 ABFC	886VKG
885AB	Equiv D33B ABFC	885AKG
885BB	Equiv H16G ABFC	885BKG
885CB	Equiv H10 ABFC	885CKG
885DB	Equiv P31 ABFC	885DKG

19. War damage repair of MSRs on other than the island of Sicily

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
851AW	MSR Repair	851AKG
851AW	Road Surface WDR	85110A

20. Construction of marshalling yards

21. Construction of POL storage and dispensing facilities, erection of deployed ABFCs, and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of various austere POL facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
121AB	A/C Fuel Disp Hyd	121AKG
121BB	A/C Truck Fuel Fac	12120A
122BB	B5B Barge Pool	122B1KG
124AB	A/C OP Fuel Stor	12430B
124BB	D3A Tank Farm (Med)	124B1KG
124CB	Veh Op Fuel Sto	12310B
124CB	D4C Tank Farm (Sm)	124C1KG
124CB	Veh Op Fuel Sto	12310A
124CB	Op Fuel Storage	12310A
124CB	Veh Op Fuel Sto	12310L
411AB	Ship Fuel Storage	12310B
411AB	Ship Fuel Storage	41110D
411BB	H14E Av Tk Farm	411B1KG
411BB	AVGAS Storage	12310B
411CB	Diesel Storage	12310B
411DB	MOGAS Storage	12310B
411EB	Jet Fuel Sto	41150C
411EB	JP Storage	12310B
887VB	Equiv H14K ABFC	887VKG
886PB	Equiv B5B ABFC	886PKG
886SB	Equiv D4C ABFC	886SKG

22. Construction of open and covered ammunition storage sites

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
421AB	Depot Ammo Cov Sto	421AKG
425AB	Ammo Open Storage	425AKG
425AB	Ammo Open Storage	14910E
851BB	Bailey Bridge	85120H

23. War damage repair of railroad tracks and bridges

24. Construction of base camp facilities, including emergency messing and berthing, administrative facilities, confinement facilities, perimeter physical security, electricity source and distribution systems, and water treatment facilities; erection of deployed ABFCs; and, where specific requirements for austere base support facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
610AB	Admin Tent	61010R
725AB	Emer Trp Hsng 65 men	72510S
725AB	Emer Trp Hsng 130 men	72510T
725BB	Emer Mess 100 men	72210AB
725BB	Emer Mess 250 men	72210AC
725BB	Emer Mess 800 men	72210AE
811AB	Elec Power 2-15	81110AB
811AB	Elec Power 2-200	81110CU
811AB	Elec Power Fldlt trl	81110BA
811AB	Elec Power Plant	81110CW
811AB	Elec Power Plant	81110CV
811AB	Elec Power 3-100	81110CR
811AB	Elec Power Plant	81110CA
811AB	Elec Power Plant	81110P
811AB	Elec Power Plant	81110CN
811AB	Elec Power 2-100	81110AP
812AB	Electrical Distr	81230BY
812AB	Electrical Distr	81230CY
812AB	Electrical Distr	81230AC
812AB	Electrical Distr	81230U
812AB	Electrical Distr	81230BG
812AB	Electrical Distr	81230AB
841BB	Water Treatment	84110C
841BB	Water Treatment	84110A
842AB	Water Distr	84210CE
842AB	Water Distr	84210G
842AB	Water Distr	84210AN
842AB	Water Distr	84210M
872AB	Security Fence	87210N
872AB	Security Fence	872AKG
872AB	Security Fence	87210G
886IB	Equiv N24A ABFC	886IKG
886NB	Equiv A17 ABFC	886NKG
886QB	Equiv B13C ABFC	886QKG
887AB	P15 Base Power Plant	811A1KG
887CB	Equiv A3 ABFC	887CKG
887DB	Equiv A7 ABFC	887DKG
887EB	Equiv A18 ABFC	887EKG
887JB	Equiv D24C ABFC	887JKG
888AB	A3 Admin/Brig/Post ofc	610A1KG

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
888BB	A4 Admin Facility	610A2KG
888CB	A7 Shore Patrol	730B1KG
888DB	A17 Int Sec Bn	730B2KG
888HB	D24C Ship Store	740A1KG
888MB	N2A Camp, 100 man	725A1KG
888NB	N24A Camp, 750 man	725A2KG

25. Construction of maintenance facilities and shops--organizational maintenance, engines, vehicles, weapons, electronic/communications, avionics, parachutes/dinghies, and base facilities; erection of deployed ABFCs; and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of various austere maintenance facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
211DB	A/C Org Maint Fac	211DKG
211EB	A/C Engine Rpr Fac	211EKG
213BB	E3 Ship Repair	213B1KG
213BB	E8 Boat Repair	213B2KG
214BB	Auto Vehicle Shop	214BKG
215AB	Wpns Maint Fac	215AKG
216AB	Ammo Maint Fac	216AKG
216AB	H9M P-3 Wpns Fac	216A1KG
217AB	Elec/Commo Shop	217AKG
217BB	Avionics Shop	217BKG
218AB	P5A Auto Svc/Mnt	218A1KG
218DB	Para Maint Fac	218DKG
219AB	Base Fac Maint	21910N
886JB	Equiv P5A ABFC	886JKG
886TB	Equiv E3 ABFC	886TKG
886UB	Equiv E8 ABFC	886UKG
887UB	Equiv H9M ABFC	887UKG
887XB	Equiv J1 ABFC	887XKG
887YB	Equiv J10D ABFC	887YKG
888OB	P31 Naval Sup Unit	219A1KG

26. War damage repair of maintenance facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
211DW	A/C Orig Maint Repair	211DKG
216AW	Ammo Maint Repair	216AKG
217AW	Elec/Comm Shop Repair	217AKG
218DW	Para Maint Fac	218DKG
219AW	Base Fac Maint	21910N

27. Erection of deployed ABFCs for airfield/heliport maintenance, and where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of various austere airfield/heliport support facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
887SB	Equiv H9J ABFC	887SKG
887TB	Equiv H9L ABFC	887SKG
888IB	H9J P3 Sup Fac	211D1KG
888JB	H9K P3A/B Sup Fac	211D2KG
888KB	H10 Air Ops Sup	141L1KG
888LB	H16G Meteorology	141L2KG

28. Fire-fighting operations

PRIORITY 3

TASK

29. Expansion of existing fixed-wing runways

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
111AB	Fixed Wing Runway	11110A

30. Construction of POL pipelines

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
125AB	1960LF Pipeline	12510D

31. Maintenance of MSRs

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
999HB	Daily MSR Maint	85140AZ

32. Construction of access roads

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
888UB	220LF Access Road	888UKG

33. Construction of base and depot storage facilities-Cold, covered, and open storage, and austere hardstands; erection of deployed ABFCs; and, where specific requirements for ABFCs have been pre-identified but where none are being deployed, construction of austere supply support and refrigerated storage facilities

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
431AB	D32A Cold Sto 4K	431A1KG
431AB	Depot Cold Sto	43110G
431AB	D32B Cold Sto 1.7K	431A2KG
432AB	Base Cold Storage	43110G
441AB	D31D Supply Spt (mn)	441A3KG
441AB	D31C Supply Spt (sm)	441A2KG
441AB	Depot Covered Storage	441AKG
441AB	D31B Supply Spt (md)	441A1KG
442AB	Base Cov Storage	442AKG
451AB	Depot Open Storage	45110A
452AB	Base Open Storage	45110A
887LB	Equiv D31B ABFC	887LKG
887MB	Equiv D31C ABFC	887MKG
887NB	Equiv D31D ABFC	887NKG
8870B	Equiv D32A ABFC	8870KG

34. Operation and maintenance of base facilities; general public works

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
888VB	Public Works 10K	888V1KG
888VB	Public Works 7.5K	888V2KG
888VB	Public Works 5K	888V3KG

35. War damage repair and maintenance of access roads

36. War damage repair of administrative and storage facilities--depot and base covered storage, and depot and base open storage

JCS CAT CODE	CAT CODE DESCRIPTION	COMPONENT CODE
441AW	Depot Cov Sto Repair	441AKG
442AW	Base Cov Sto Repair	442AKG
451AW	Depot Open Sto Repair	45110A
452AW	Base Open Sto Repair	45110A
610AW	Admin Tent	61010R

37. Construction of emergency mass grave sites

38. War damage repair to troop camps

39. War damage repair to hospitals

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